UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/770,092	02/02/2004	Tae-jin Ahn	YPL-0078	9277

23413 7590 12/27/2006	EXAMINER
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BLOOMFIELD, CT 06002	ART UNIT / PAPER NUMBER

ART UNIT	PAPER NUMBER
1631	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/27/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

		Application No.	Applicant(s)
Office Action Summary		10/770,092	AHN, TAE-JIN
		Examiner	Art Unit
		Carolyn L. Smith	1631

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>01 November 2006</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-19</u> is/are pending in the application.

　　4a) Of the above claim(s) <u>10-18</u> is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-9 and 19</u> is/are rejected.

7)☒ Claim(s) <u>2</u> is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>02 February 2004</u> is/are: a)☐ accepted or b)☒ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☒ All　b)☐ Some * c)☐ None of:

　　　1.☒ Certified copies of the priority documents have been received.

　　　2.☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>2272006</u>.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____ .

DETAILED ACTION

Applicant's election without traverse of Group I (claims 1-9 and 19), filed 11/1/06, is

acknowledged. Claims 10-18 are withdrawn from consideration as being drawn to a non-elected

Group.

Claims 1-9 and 19 are herein under examination.

Drawings

This application contains sequence disclosures that are encompassed by the definitions

for nucleotide and/or amino acid sequences set forth in 37 CFR § 1.821 (a)(1) and (a)(2). See for

example, Figures 2 and 3. However, this application fails to comply with the requirements of 37

CFR § 1.821 through 1.825, because it lacks a paper copy, computer readable form, or CD-ROM

and SEQ ID Nos cited along with each sequence in the Figures. Applicants are also reminded

that SEQ ID Nos are not required in Figures per se, however, the corresponding SEQ ID Nos

then are required in the Brief Description of the Drawings section in the specification.

Applicants are also reminded that a CD-ROM sequence listing submission may replace the paper

sequence listing copies. Applicant(s) are required to submit a computer readable form sequence

listing, and a paper copy, or CD-ROM incorporated by reference into the specification,

statements under 37 CFR § 1.821 (f) and (g), if there is a need to list additional sequences in the

sequence listing. Applicant(s) are given the same response time regarding this failure to comply

as that set forth to respond to this office action. Failure to respond to this requirement may result

in abandonment of the instant application or a notice of a failure to fully respond to this Office

Action.

Figure 2 is objected to because it contains an embedded hyperlink and/or other form of

browser-executable code. Applicant is required to delete the embedded hyperlink and/or other

form of browser-executable code. See MPEP § 608.01.

Claim Objections

Claim 2 is objected to because of the following informality: Claim 2 (line 1) recites "the

characters" in plural form and then "comprises" in singular form that is grammatically awkward.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of
matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions
and requirements of this title.

Claims 1-2, 4-9 and 19 are rejected under 35 U.S.C. 101 because the claimed invention is

directed to non-statutory subject matter.

In the instant case, the claims are directed to an apparatus and computer readable

medium.

Claims 1-2 and 4-9 are directed to an apparatus for encoding a DNA sequence that can be

interpreted to comprise software units that are not statutory subject matter. It is further noted

that the apparatus does not result in a physical transformation of matter, or recite any concrete, tangible and useful result; i.e. a practical application, as required under the Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility (published in the O.G. notice (1300 OG 142) on 11/22/2005). For example, an apparatus comprising units performing steps that may take place entirely within the confines of a computer without any communication to the outside world does not include a tangible or real world result.

Claim 19 is directed to a computer readable medium comprising a program that is not statutory. It is noted that a program is not statutory subject matter. In addition, the Guidelines say that a computer readable medium may be a carrier wave, such as a satellite signal. A carrier wave is clearly NOT a physical object, and thus does not fall into one of the four statutory categories of invention. It is noted that the instant specification gives examples of physical media (i.e. CD-ROMs, floppy disks, etc. on page 14, second paragraph) that may be amended into claim 19 to limit the medium to a physical object. Limiting claim 19 to a physical object would make it statutory subject matter.

Claims Rejected Under 35 U.S.C. § 112, Second Paragraph

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-9 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

Claim 1 recites the limitation "the individual characters" in lines 9 and 10. There is insufficient antecedent basis for this limitation in the claim as it is unclear if the characters are referring to characters from the reference sequence, the subject sequence, or the extracted difference characters. Clarification of this issue via clearer claim wording is requested. Claims 2-9 are also rejected due to their dependency from claim 1.

Claims 1 (lines 10-11), 2 (line 1), 5 (line 2), and 6 (last line) recite the limitation "the characters". There is insufficient antecedent basis for this limitation in the claim as it is unclear if the characters are referring to characters from the reference sequence, the subject sequence, the extracted difference, or the individual characters. Clarification of this issue via clearer claim wording is requested. Claims 3-4 and 7-9 are also rejected due to their direct or indirect dependency from claim 1.

Claim 2 (last line) recites the phrase "continuation of the difference" which is vague and indefinite. The intended meaning of "continuation of the difference" is unclear. If the difference is a finite amount, it is unclear how there can be a continuation of it. Clarification of this issue via clearer claim wording is requested. Claim 3 is also rejected due to its dependency from claim 2.

Claim 3 recites "starting, start position, continuation, the number of continued bases [...] and outputs the string of characters". It is not clear what the intended meaning of this claim is as it is unclear to what some of these terms are referring. For example, "starting" of what?

"Starting position" of what? If "third character represents the starting and ending of the difference" in claim 2, what is the intended meaning of "distance between the start position and the end position of the difference *into the third character*" mean? On lines 4-6, it is unclear why "the second character" is recited three times. Clarification of this issue via clearer claim wording is requested.

Claim 4 (line 1) recites the phrase "the difference comprises" in singular form and then lists a plurality of various limitations. It is unclear if all of the limitations in claim 4 need to be present to be considered the "difference" or if the presence of just one of these limitations would suffice for being the "difference" (with the other "difference" limitations holding zero instances) since these limitations appear to be independent of each other and all represent a singular difference. Clarification of this issue is requested via clearer claim wording.

Claim 4 (lines 2-3) recites "blank by base deletion" which is vague and indefinite. It is unclear how Applicant intends to define this phrase. Is there a blank space left due to a deletion caused by similarity or difference in the aligned subject and reference sequences? Does the blank occur due to an unclear signal in reading the sequence? Clarification of this issue via clearer claim wording is requested.

Claim 8 (line 2) recites the phrase "variation sequence generation factor" which is vague and indefinite. It is unclear how Applicant intends to define this phrase. Clarification of this issue via clearer claim wording is requested. Claim 9 is also rejected due to its dependency from claim 8.

Claim 9 recites the limitation "the variance sequence induction factor" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. While there is previous mention

of a "variation sequence generation factor" in claim 8 from which claim 9 depends, there is no

previous mention of a variance sequence induction factor. Clarification of this issue via clearer

claim wording is requested.

Claim 19 (penultimate line) recites the limitation "the individual characters". There is

insufficient antecedent basis for this limitation in the claim. While there is prior mention of

"predetermined characters", there is no previous mention of "individual characters".

Clarification of this issue via clearer claim wording is requested.

Claim 19 (penultimate line) recites the limitation "the characters". There is insufficient

antecedent basis for this limitation in the claim. It is unclear if this phrase is referring to the

"individual characters", encoded "individual characters", or the "string of predetermined

characters" as previously recited in claim 19. Clarification of this issue via clearer claim

wording is requested.

Claim Rejections – 35 USC §102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 6, 7 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by

Grumbach et al. (Information Processing & Management, Volume 30, Number 6, pages 875-886,

1994).

Grumbach et al. disclose using UNIX (computer operating system) and ASCII files with algorithms to encode DNA sequences (page 876, second and third paragraphs and page 878, second and third paragraphs) which represents an apparatus and computer readable medium for a encoding DNA sequence, as stated in the preamble of instant claims 1 and 19. Grumbach et al. disclose storing a DNA sequence by encoding individual DNA characters (Figure 1 and page 878, third paragraph). Grumbach et al. disclose using a dictionary containing already encoded factors (page 879, third paragraph) that represents predetermined conversion codes. Grumbach et al. disclose having a start position and matching the factor at the current position followed by outputting a codeword (page 881, second paragraph), compression algorithms including a vertical mode, where a DNA sequence A is compressed with respect to another sequence B with output containing information to construct sequence A from sequence B (page 876, fifth paragraph), using codewords to encode strings and arithmetic encoding (page 876, third paragraph and page 879, first paragraph), and storing a reference sequence in a database while other sequences are stored in a compressed form with respect to it (page 876, fifth paragraph) which represents the comparative, conversion, code storage, and encoding units (as stated in instant claim 1), the compression and storage units (as stated in instant claim 7), and the aligning, extracting, converting, and encoding steps (as stated in instant claim 19). Grumbach et al. disclose statistical and substitutional compression of text via encoding blocks of fixed length and encoding factors of different lengths using a pointer to one of their previous occurrences in the text (page 875, third paragraph) which represents a division unit, as stated in instant claim 6. Grumbach et al. disclose using a codeword including "l" for the length of the factor, and "p" for the position of the first occurrence (page 881, first paragraph). Grumbach et al. disclose

encoding DNA base symbols on bits of codewords (page 881, last paragraph) and characters

representing the number of substitutional difference during compression (page 882, first and

second paragraphs). Grumbach et al. disclose using output code containing three types of

codewords: literal, numerical, and copy codewords (page 882, first paragraph).

Thus, Grumbach et al. anticipates claims 1, 6, 7, and 19.

Claim Rejections – 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth
in section 102 of this title, if the differences between the subject matter sought to be patented and the
prior art are such that the subject matter as a whole would have been obvious at the time the invention
was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability
shall not be negatived by the manner in which the invention was made.

Claims 2-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grumbach et

al. (Information Processing & Management, Volume 30, Number 6, pages 875-886, 1994) as

applied to claims 1, 6, 7, and 19 above, and further in view of Robson et al. (1992).

Grumbach et al. disclose the limitations of instant claims 1, 6, 7, and 19, as discussed in

the 35 USC 102 rejection above. Grumbach et al. describe using characters to code DNA

symbols (page 881, last paragraph) and characters representing the number of substitutional

difference during compression (page 882, first and second paragraphs). Grumbach et al. describe

outputting codewords (page 881, second paragraph). Grumbach et al. do not describe all of the

limitations stated in instant claims 2-5.

Robson et al. describe storing and analyzing nucleic acid sequences including quantifying and exploring sequence relationships, using standard searching algorithms (i.e. BLAST), comparing sequences (page 285, column 1, second paragraph and page 288, first paragraph), and encoding sequence information (page 283, first column, last paragraph and second column, third and fourth paragraphs). Robson et al. describe using 4 bit code (page 286, first column, line 2; page 287, first column, last paragraph), as stated in instant claim 5. Robson et al. describe using 4 bit codes which correspond to characters including the start or end of the sequence, continue to read, ending, sequence separator (i.e. distance between start and end position), matches, and various other characters (page 287, column 1, last paragraph to column 2, first paragraph), as stated in instant claim 3. Robson et al. describe using code to signify differences and their number, such as unknowns, blanks, and deletions (page 287, first column), as stated in instant claims 2 and 4.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the apparatus of Grumbach et al. by using the 4 bit code words and characters as taught by Robson et al. where the motivation would have been to perform searching in a more intelligent, structured, and faster manner since numerical bioinformatics descriptions are of value whenever the quality and quantity of information is very large, as stated by Robson et al. (page 284, column 1, third paragraph and abstract).

Thus, Grumbach et al., in view of Robson et al., make obvious claims 1-7 and 19.

Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grumbach et

al. (Information Processing & Management, Volume 30, Number 6, pages 875-886, 1994) as

applied to claims 1, 6, 7, and 19 above, and further in view of Selifonov et al. (US 2002/0183934

A1).

Grumbach et al. disclose the limitations of instant claims 1, 6, 7, and 19, as discussed in

the 35 USC 102 rejection above. Grumbach et al. describe using characters to code DNA

symbols (page 881, last paragraph) and characters representing the number of substitutional

difference during compression (page 882, first and second paragraphs). Grumbach et al. describe

outputting codewords (page 881, second paragraph). Grumbach et al. do not describe all of the

limitations stated in instant claims 8 and 9.

Selifonov et al. describe making character strings for polynucleotides (title). Selifonov et

al. describe generating random variation of sequences via multiplication factors (0075, 0117,

0197), as stated in instant claim 8. Selifonov et al. describe sequences including lengths, type,

number/round of evolution and nucleic acid shuffling, and mutated fragments of predefined

lengths, and software for sequence string manipulation (0026-0028) which represents the

variation sequence induction factor, as stated in instant claim 9.

It would have been obvious to one of ordinary skill in the art at the time the invention

was made to modify the apparatus of Grumbach et al. by creating a variation sequence as taught

by Selifonov et al. wherein the motivation would have been to provide for the rapid evolution of

nucleic acids for the generation of encoded molecules (e.g., nucleic acids and proteins) with new

and/or improved properties of industrial, agricultural and therapeutic importance which can be

created or improved through DNA shuffling procedures, as stated by Selifonov et al. (0008).

Thus, Grumbach et al. in view of Selifonov et al. make obvious claims 1, 6-9, and 19.
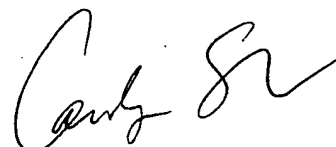
Conclusion

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the PTO Fax Center. The faxing of such papers must conform with the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993) (See 37 CFR §1.6(d)). The Central Fax Center number for official correspondence is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carolyn Smith, whose telephone number is (571) 272-0721. The examiner can normally be reached Monday through Thursday from 8 A.M. to 6:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Wang, can be reached on (571) 272-0811.

December 18, 2006

Carolyn Smith
Examiner
AU 1631